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The Impact of Type D Personality on Health-Related Quality of Life in Tinnitus Patients Is Mainly Mediated by Anxiety and Depression

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Objective: To evaluate the impact of Type D personality on health-related quality of life (HRQoL) and self-reported tinnitus-related distress in chronic tinnitus patients and whether this relationship is mediated by indicators of psychological distress (i.e., vital exhaustion, anxiety, and depression).

Materials and Methods: Using a cross-sectional study design, 265 consecutive tinnitus patients were asked to complete the Hospital Anxiety and Depression Scale, the Maastricht Questionnaire, the Type D Scale (DS14), the Short-Form Health Survey 36, and the Tinnitus Reaction Questionnaire.

Results: The prevalence of Type D was 35.5%. Type D patients were significantly more anxious, depressed, and vitally exhausted, and experienced more impaired HRQoL and increased tinnitus-related distress compared with non-Type D patients. Structural equation modeling showed that Type D personality directly increased symptoms of depression and anxiety, but not vital exhaustion. Type D was also a direct predictor of poor mental and physical HRQoL and increased tinnitus-related distress, although this influence was mainly mediated by symptoms of depression and anxiety. Anxiety,

depression, and vital exhaustion had a direct influence on HRQoL and self-reported tinnitus-related distress, with a higher impact on mental HRQoL ($R^2 = 0.74$) compared with physical HRQoL ($R^2 = 0.33$). Vital exhaustion was a predictor of HRQoL and self-reported tinnitus-related distress; however, its influence was moderated by enhanced levels of anxiety and depression.

Conclusion: Tinnitus patients with a Type D personality were more likely to be anxious and depressed and to experience poor HRQoL and increased self-reported tinnitus-related distress, with the impact of Type D mainly being mediated by symptoms of anxiety and depression, although Type D also exerted a direct influence on these outcomes. These findings underline that to reduce the impact of tinnitus on HRQoL and self-reported tinnitus-related distress, treatment should be directed toward reducing anxiety and depression, especially in patients with a Type D personality. **Key Words:** Anxiety—Depressive symptoms—Tinnitus—Type D personality—Vital exhaustion.

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Chronic subjective tinnitus is a common and often disturbing condition, affecting 10 to 30% (1) of the adult population. Approximately 1 to 5% of the population is severely affected by their tinnitus (1). Annoyance ratings and subjective loudness judgments frequently vary over time, and a wide variation exists in the impact of tinnitus on everyday activities and health-related quality of life (HRQoL). It seems to bother some patients only slightly,

whereas the impact on other patients is much more profound, leading to a reduction in daily activities and poor HRQoL. Personality characteristics previously described to be associated with tinnitus severity and psychological distress include hysteria and hypochondriasis (2), neuroticism (3,4), lower levels of extraversion (3,4), withdrawal, and emotional isolation (2).

Significantly perceived handicap and psychological distress have been described in approximately 40 to 50% of people with tinnitus (5). This is related to a variety of tinnitus-related complaints, including anxiety, depression, insomnia, concentration problems, irritability, anger,

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frustration, inability to relax, feelings of helplessness, avoidance of noisy or quiet situations, withdrawal from social events, and emotional problems in relationships with family, friends, and colleagues. The perceived distress due to tinnitus varies during the day and between days in most patients. Frequently, a relation exists between the perception of severe tinnitus and the presence of excessive stress or emotions (6). Tinnitus noises become troublesome if the patient focuses the attention on the tinnitus (7), with tinnitus-related distress likely being modulated by its uncontrollability and maladaptive coping strategies (3,8).

The negative impact of anxiety and depression on HRQoL of tinnitus patients has been described by several authors. In this study, we introduce vital exhaustion as an additional dimension of distress. Because perceived tinnitus-related distress has previously been associated with symptoms such as insomnia (9), concentration problems (9,10), and relaxation problems (11,12), we hypothesized that tinnitus patients have increased vital exhaustion. Vital exhaustion is a mental state, defined as extreme fatigue, increased irritability, and demoralization (13). Vital exhaustion has been studied predominantly in patients with cardiovascular disease (CVD) or cancer (14,15). In CVD patients, symptoms of fatigue and vital exhaustion have been described to be more prevalent in patients with a Type D (distressed) personality (16), a personality taxonomy characterized by high levels of negative affectivity and social inhibition. Type D patients tend to experience increased negative emotions, generally feel sad and have a gloomy view of life, while not sharing these emotions with others due to fears of how they may react (17). Because of the embedment of social inhibition within the Type D construct, it is not merely a measure of negative affect, such as anxiety and depression, with Type D—unlike measures of negative affect—also stipulating how patients deal with their negative emotions.

There is increasing evidence that a Type D personality is associated with a wide range of emotional distress (e.g., anxiety, depression, and posttraumatic stress disorder), impaired quality of life and health status, lower level of social support, and increased risk of mortality and morbidity, all independent of demographic and clinical risk factors, including disease severity (18). In other words, Type D personality seems to play a modulating role in health-related functional status, quality of life, and clinical, patient-based outcomes. The influence of Type D personality on health outcomes cannot be attributed to these patients being more severely ill (19,20). Although the Type D construct was predominantly investigated among cardiovascular patients, we have previously shown that tinnitus patients are more likely to have a Type D personality than healthy controls (21). Therefore, tinnitus patients with a Type D personality may also be likely to experience more distress and poorer HRQoL.

In the current study, we evaluated the impact of Type D personality on HRQoL and self-reported tinnitus-related distress in chronic tinnitus patients and whether this rela-

tionship is mediated by indicators of psychological distress (i.e., vital exhaustion, anxiety, and depression).

MATERIALS AND METHODS

Patients and Design

Consecutive chronic subjective tinnitus patients ($n = 265$) seen at the Department of Otorhinolaryngology of the University Medical Center Groningen, the Netherlands, were included in the current study. The diagnosis of tinnitus differentiates between objective and subjective tinnitus. Objective tinnitus is a perception of sound that is physically generated inside the body of the patient (22). Patients perceive real sounds that are sensed in the same way as normal sounds. These sounds can usually be heard by an external observer (22) and are conducted to the cochlea by bone conduction or to the middle ear cavity. Subjective tinnitus is a phantom perception of sound without any physical sound being present (22). The only information known regarding the sound is what the patient reports. Because this type of tinnitus has no objective signs, it cannot be assessed by means of objective tests. It is a phantom sensation of sound caused by pathologies within or around the ear, generating tinnitus in neural structures along the auditory system.

Tinnitus patients aged 20 years or older were eligible, provided that they were consulting our clinic because of chronic tinnitus, defined as duration longer than 3 months. Tinnitus patients were excluded if tinnitus was not the main reason for consulting our clinic or if they had objective tinnitus or chronic disease comorbidity. The differentiation between objective and subjective tinnitus was made by means of the assessments of our diagnostic protocol. Patient interview, otologic and general physical examinations, sometimes in combination with additional radiologic assessments and referral to other disciplines, enables the clinician to differentiate between subjective and objective tinnitus.

Procedure

Patients were asked to fill in a set of standardized and validated self-report questionnaires, assessing psychological distress, HRQoL, tinnitus-related distress, and Type D personality at home and return their questionnaire to the hospital. Self-report questionnaires rather than interviews were chosen to avoid information bias (e.g., socially desirable responses) that might occur during personal interviews conducted by the otorhinolaryngologist in charge of the subject's medical examination and treatment. The study protocol was approved by the local medical ethics committee, and all patients provided written informed consent.

MEASURES

Sociodemographic Variables

Sociodemographic variables included age, sex, marital status, working status, and educational level.

Type D (Distressed) Personality

14-Item Type D Scale

Type D personality was assessed with the 14-item Type D Scale (DS14) (17). The DS14 consists of the subscales negative affectivity (NA; 7 items; e.g., "I often feel unhappy") and social inhibition (SI; 7 items; e.g., "I am

a ‘closed’ person”). Type D personality characterizes those who tend to experience increased negative emotions and who do not express these emotions in social interactions. A cutoff score greater than or equal to 10 on both subscales denotes those with a Type D personality (23). The DS14 has adequate reliability, with Cronbach $\alpha = 0.89/0.88$ and 3-month test-retest reliability of $r = 0.72/0.82$ for the NA and the SI subscales, respectively (17).

Anxiety and Depression

The Hospital Anxiety and Depression Scale

The Hospital Anxiety and Depression Scale (HADS) was used to assess anxiety and depressive symptoms (24). The HADS is a 14-item measure, with 7 items contributing to the anxiety and depression subscales. All items are answered on a 4-point Likert scale from 0 to 3 (score range of 0–21). The HADS is a reliable questionnaire that performs well in screening for the separate dimensions of anxiety and depression (25).

Vital Exhaustion

Maastricht Questionnaire

Vital exhaustion, which is defined as mental fatigue, demoralization, and increased irritability, was assessed by the 21-item Maastricht Questionnaire (26). Each item is rated according to a 3-point scale (No = 0; ? = 1; Yes = 2), with a scale score obtained by summing the answers. Thus, the minimum score is 0 and the maximum is 42, with a high score indicating a severe level of vital exhaustion. The Maastricht Questionnaire is an internally consistent measure, with a Cronbach α of 0.89 (26).

Generic HRQoL

The Short-Form Health Survey 36

The Short-Form Health Survey 36 is a valid, reliable, and widely used generic measure of HRQoL that has been used in a myriad of studies of patients with somatic disease and healthy populations, with the 36 items contributing to 8 subscales, namely, physical functioning, role physical functioning, bodily pain, vitality, social functioning, role emotional functioning, mental health, and general health (27). These scales are standardized to a score from 0 (poor) to 100 (high) and can be combined into 2 component summary scores (i.e., a physical component summary and a mental component summary) as used in this study. The Short-Form Health Survey 36 has good reliability estimates, with Cronbach α ranging from 0.65 to 0.96 for all subscales (28).

Tinnitus Severity

Tinnitus Reaction Questionnaire

The Tinnitus Reaction Questionnaire (TRQ), developed by Wilson et al. in 1991 (29), was designed as a measure of tinnitus-related distress. The TRQ consists of 26 questions that are answered on a 5-point Likert scale

from 0 (not at all) to 4 (almost all of the time), with a score range of 0 to 104. A higher score indicates a higher level of perceived distress caused by tinnitus, also labeled as tinnitus severity. The test-retest reliability ($r = 0.88$) and internal consistency (Cronbach $\alpha = 0.96$) of the scale are good. A score on the TRQ correlates moderately to highly with clinician ratings ($r = 0.67$) and self-report measures of anxiety and depression ($r = 0.58$ – 0.87) (29).

STATISTICAL ANALYSES

Bivariate Analyses

Discrete variables were compared using the χ^2 test (Fisher’s exact test when appropriate and the difference of proportions test [30]) and are presented as numbers and percentages. Continuous variables were normally distributed (Shapiro Wilk; $p > 0.05$) and were therefore compared with the Student’s t test for independent samples and are presented as mean \pm standard deviation [SD]. Effect sizes (ES) were calculated only for the statistically significant results because differences between groups that are due to random variation have no clinical relevance. The concept ES was developed by Cohen as a generic indicator of the magnitude of a difference between sample means and proportions between independent and dependent groups for the objective of power analysis. Cohen’s ES “ d ” for unrelated samples was used to estimate the magnitude of the difference between 2 groups (mean difference score/the pooled SD). According to Cohen’s thresholds, an ES of less than 0.20 indicates a trivial difference, an ES of greater than or equal to 0.20 to less than 0.50 a small difference, an ES of greater than or equal to 0.50 to less than 0.80 a moderate difference, and an ES greater than or equal to 0.80 a large difference (31). Therefore, in this study, an ES greater than or equal to 0.20 was considered to be a clinically relevant difference between Type D and non-Type D tinnitus patients. All statistical tests were 2-tailed. A value of $p < 0.05$ was used for all tests to indicate statistical significance. All statistical analyses were performed using SPSS 13.0.1 for Windows.

Structural Equation Model

A hypothesized model was investigated with structural equation modeling using LISREL, 8.7 (32). Structural equation modeling is a multivariable technique for testing the tenability of a model in which 1) increased psychological distress (i.e., enhanced levels of depression, anxiety, and vital exhaustion) are predictors of poor mental and physical HRQoL and tinnitus-related distress, and 2) Type D personality influences directly and indirectly mental and physical HRQoL and tinnitus-related distress through its effect on the indicators of psychological distress (i.e., anxiety, depression, and vital exhaustion). The latent construct Type D personality was estimated with the indicators of NA and SI and defined as a linear combination of high scores on both subscales. To allow for mutual comparisons between the path coefficients, the completely standardized solution was used. For judging the model fit,

TABLE 1. Sociodemographic characteristics of tinnitus patients stratified by Type D personality

	Type D, n = 94	Non-Type D, N = 171	<i>p</i>	
Age, yr				
<50	62 (66.0)	99 (57.9)	0.24 ^a	
Mean (SD)	55.68 (10.67)	55.77 (11.70)	0.95 ^b	
Males	69 (73.4)	116 (67.8)	0.41 ^a	
Married/living with partner	81 (86.2)	153 (89.5)	0.43 ^a	
Working	41 (43.6)	96 (56.8)	0.06 ^a	
Educational level				95% CI
Elementary schooling	13 (15.1)	30 (18.6)	-6.1	13.2 ^c
Lower schooling	20 (23.3)	31 (19.3)	-14.8	6.8 ^c
Secondary schooling	21 (24.4)	43 (26.7)	-9.1	13.7 ^c
Higher professional training	25 (29.1)	43 (26.7)	-14.1	9.4 ^c
College education/university	7 (8.1)	14 (8.7)	-6.7	7.8 ^c

Results are presented as n (%) unless otherwise indicated.

^aFisher's exact test.

^bStudent's *t* test.

^cDifference of proportions test.

we used multiple criteria as suggested by Bentler and Bonett (33). The fit of the model was evaluated by means of 1) nonsignificant χ^2 , indicating that a nonsignificant amount of variance in the data remains unexplained; a ratio of χ^2 to the degrees of freedom less than 3 generally indicates a good model fit (34); 2) the root mean square error of approximation (RMSEA); 3) the standardized root mean square residual (SRMR); 4) the comparative fit index (CFI); and 5) the adjusted goodness of fit index (AGFI). Both CFI and RMSEA were used because it has been argued that they provide more stable and accurate estimates than several of the other fit indices (35). Structural paths with related *t* values greater than 1.96 can be regarded as significant at $p < 0.05$ (i.e., parameter estimates ± 1.96 standard errors should exclude 0). Given their complementary features, we used all 5 indices compared against their critical values to evaluate the models.

RESULTS

The response to the request to fill in the questionnaire was 97%. Selection bias was analyzed with appropriate

statistical tests (*t* test, Fisher's exact test, and difference between proportions test), with the result that nonresponders did not deviate from the patients in our sample with regard to age, sex, marital status, working status, and education status.

Baseline Characteristics Stratified by Type D Personality

The prevalence of Type D personality was 35.5% in patients with chronic tinnitus. Type D tinnitus patients did not differ significantly from non-Type D tinnitus patients on sociodemographic characteristics (Table 1).

Differences in Distress and HRQoL Between Type D and Non-Type D Tinnitus Patients

Means, standard deviations, *p* values, and effect sizes for the different measures of psychological distress and HRQoL are shown in Table 2. Type D tinnitus patients reported more anxiety, more depressive symptoms, more symptoms of vital exhaustion, and poorer general HRQoL and tinnitus-related distress compared with non-Type D patients. All differences in psychological distress and HRQoL outcomes were statistically significant ($p < 0.001$) and clinically relevant, as indicated by a large ES (≥ 0.80) according to Cohen effect size index. The effect size for the difference in physical HRQoL between Type D and non-Type D patients was moderate (ES = 0.61; Table 2).

The Relationship Between Type D Personality, Psychological Distress, HRQoL, and Tinnitus-Related Distress (LISREL Models)

All models were evaluated by examining the parameter estimates and by the indices of overall fit provided by LISREL. Residual correlations between NA and SI, and between anxiety and depression, were allowed because they belonged to the same measure and were assessed simultaneously. All model parameters met the criteria for good model fit (Table 3). For each model, the χ^2 statistic indicated that a nonsignificant amount of variance in the data remained unexplained and relative to degrees of freedom was less than two, suggesting a good initial fit. The RMSEA was sufficiently low (< 0.06), as was the SRMR (< 0.005). The CFI value of 1.00 exceeded the 0.97 value, and the AGFI index was greater than 0.95.

TABLE 2. Differences in psychological distress, tinnitus-related distress, and HRQoL stratified by Type D personality

	Type D (n = 94)		Non-Type D (n = 171)		<i>p</i> ^a	ES	95% CI for ES	
	Mean	SD	Mean	SD			Lower	Upper
Psychological distress								
Anxiety	10.99	3.97	6.37	4.27	0.0001	1.11	0.83	1.37
Depression	10.25	3.99	5.70	4.57	0.0001	1.04	0.77	1.30
Vital exhaustion	33.77	7.88	20.76	11.88	0.0001	1.22	0.95	1.49
HRQoL								
Mental HRQoL	41.49	19.44	66.20	22.58	0.0001	1.15	0.88	1.42
Physical HRQoL	56.43	18.49	66.99	16.54	0.0001	0.61	0.35	0.87
Tinnitus-related distress	63.40	15.46	42.59	21.94	0.0001	1.05	0.78	1.31

^a*t* Test.

TABLE 3. Parameters of model fit for mental, physical HRQoL, and tinnitus-related distress

Critical values of parameter estimates	χ^2	df	p	RMSEA <0.06	AGFI >0.95	SRMR <0.05	CFI ^a >0.97	R ²
Parameter estimates								
Mental HRQoL (SF-36)	5.09	3	0.17	0.051	0.96	0.014	1.00	74
Physical HRQoL (SF-36)	5.82	3	0.12	0.06	0.95	0.019	1.00	33
Tinnitus-related distress (TRQ)	5.96	3	0.11	0.56	0.95	0.001	1.00	65

^aThe CFI with a value >0.97 indicates a good fit. According to Hu and Bentler (35), this criterion is more appropriate than the >0.95 criterion because the large number of severely misspecified models is unacceptable.

Taken together, these results suggest that the hypothesized models fitted the data well.

Figures 1 and 2 show the results of the path model, depicted by the direct and mediated paths between Type D personality, anxiety, depression, and vital exhaustion, and the outcomes HRQoL and tinnitus-related distress, respectively. Health-related quality of life is differentiated into summary components of mental and physical HRQoL. According to our hypothesis, Type D personality directly led to an increase in symptoms of anxiety, depression and tinnitus-related distress, and to poor HRQoL. No direct relation was found between Type D and vital exhaustion. Presented figures demonstrate that anxiety and depressive symptoms mediate the impact of Type D on HRQoL and tinnitus-related distress, although Type D also has a direct effect on mental and physical HRQoL and tinnitus-related distress. The more anxious, depressed, or vitally exhausted patients were, the poorer both mental HRQoL ($\beta = -0.30$, $\beta = -0.30$, and $\beta =$

-0.29 , respectively) and physical HRQoL ($\beta = -0.28$, $\beta = -0.34$, and $\beta = -0.45$, respectively), and the more tinnitus-related distress increased ($\beta = 0.21$, $\beta = 0.25$, and $\beta = 0.19$, respectively). These parameter estimates were significant (with negative β coefficients for HRQoL and positive β coefficients for TRQ), indicating that increased symptoms of anxiety, depression, and vital exhaustion led to reduced mental and physical HRQoL and increased tinnitus-related distress.

Physical HRQoL (First Coefficients)

Anxiety, depression, and vital exhaustion were all associated with poor physical HRQoL in the tinnitus population ($\beta = -0.28^{**}$, -0.34^{**} , -0.45^{**} , respectively). Type D personality significantly increased anxiety, depression ($\beta = 0.86^{**}$, $\beta = 0.84^{**}$) and decreased physical HRQoL ($\beta = -0.53^{**}$), but Type D did not directly influence vital exhaustion (arrow not depicted). Moreover, the path analyses showed that the influence of

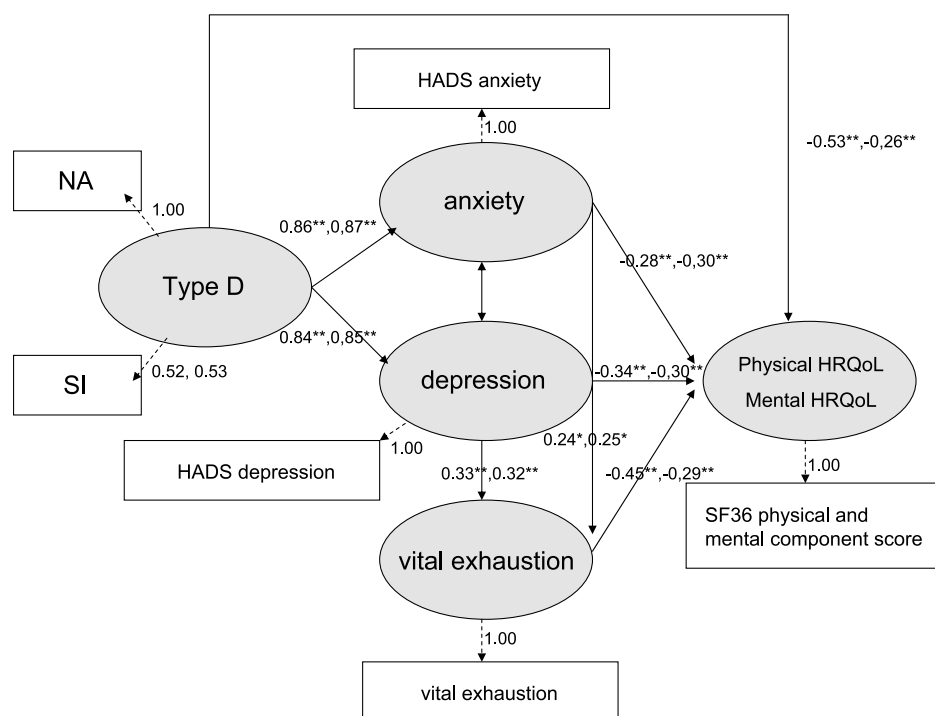


FIG. 1. A path model of Type D personality as predictor of poor physical and mental HRQoL mediated by anxiety and depression in tinnitus patients. Standardized coefficients indicating relationships between variables are shown close to the relevant path. The first coefficient indicates the relationship for the physical HRQoL model; the second indicates the relationship for the mental health model. Path coefficients are all statistically significant * <0.05 ; ** <0.01 .

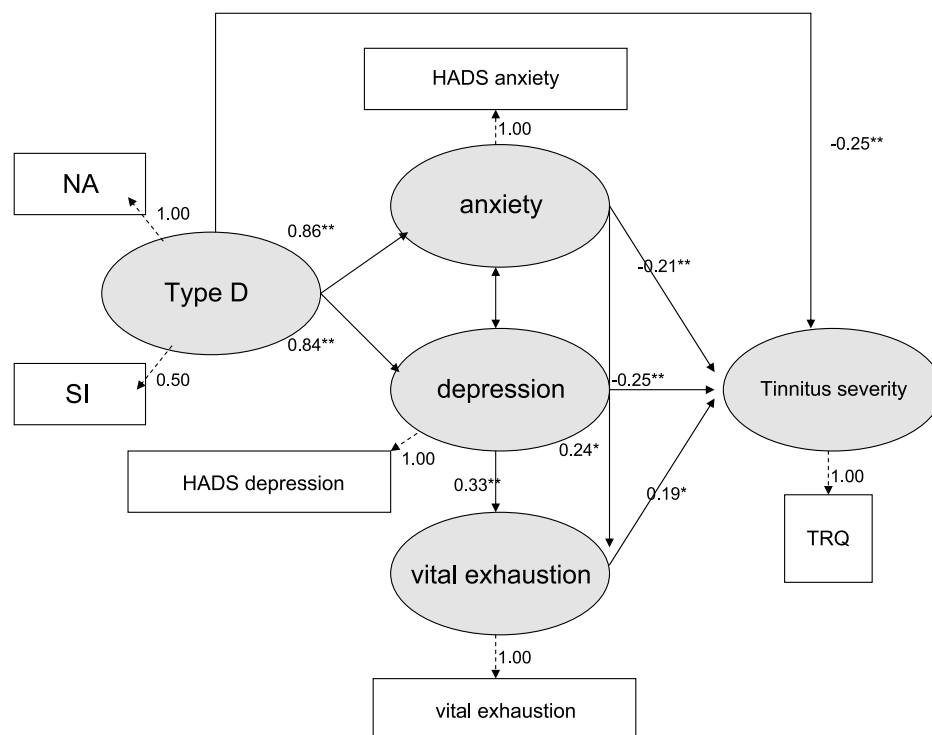


FIG. 2. A path model of Type D personality as predictor of increased tinnitus-related distress mediated by anxiety and depression in tinnitus patients. Coefficients are all statistically significant * <0.05 , ** <0.01 .

vital exhaustion on physical HRQoL was moderated by anxiety ($\beta = 0.24^*$) and depression ($\beta = 0.33^{**}$). In other words, vital exhaustion may be more strongly associated with poor HRQoL when patients also experience high levels of anxiety and depression compared with low levels of anxiety and depression (Fig. 1).

Mental HRQoL (Second Coefficients)

This model shows that all indicators of psychological distress decreased mental HRQoL in the tinnitus population at a level comparable to that of physical HRQoL ($\beta = -0.30^{**}$, -0.30^{**} , -0.29^{**}). Type D directly elevated anxiety ($\beta = 0.87^{**}$) and depression ($\beta = 0.85^{**}$) and decreased mental HRQoL ($\beta = -0.26^*$), but did not lead to increased vital exhaustion (arrow not depicted). Furthermore, the path analyses showed that the influence of vital exhaustion on mental HRQoL was moderated by anxiety ($\beta = 0.25^*$) and depression ($\beta = 0.32^{**}$), which was also the case for physical HRQoL.

Tinnitus-Related Distress

All direct paths from anxiety, depression, and vital exhaustion to tinnitus-related distress had positive beta coefficients, indicating that more symptoms of anxiety, depression and vital exhaustion increased tinnitus-related distress ($\beta = 0.21^*$, $\beta = 0.25^{**}$ and $\beta = 0.19^*$, respectively). Type D increased anxiety ($\beta = 0.86^{**}$), depressive symptoms ($\beta = 0.84^{**}$), and tinnitus-related distress ($\beta = 0.25^*$), but no significant pathways were found between Type D and vital exhaustion. The influence of vital exhaustion on tinnitus-related distress was moder-

ated by anxiety ($\beta = 0.24^*$) and depression ($\beta = 0.33^{**}$), which confirms the results from the preceding models predicting HRQoL (Fig. 2).

Type D personality, anxiety and depression explained 74% of the variance in mental HRQoL, 33% of the variance in physical HRQoL, and 69% of the variance in tinnitus-related distress.

DISCUSSION

In this study of a tinnitus population, we found statistically significant and clinically relevant differences in all measures of psychological distress (i.e., anxiety, depression, and vital exhaustion), HRQoL, and tinnitus-related distress between Type D versus non-Type D patients, with Type D patients reporting more distress and poorer HRQoL on all outcomes. The two personality types were comparable on sociodemographic characteristics. Because we were interested in the influence of Type D personality and indicators of psychological distress on mental and physical HRQoL and tinnitus-related distress, we performed path analyses by means of structural equation modeling using LISREL.

Type D personality was a direct predictor of mental and physical HRQoL and tinnitus-related distress, but the impact of Type D on HRQoL and tinnitus-related distress was mainly mediated by anxiety and depression. Anxiety and depression were direct major predictors of mental and physical HRQoL and tinnitus-related distress in the tinnitus population, but also indirect via enhancing vital exhaustion. These results provide evidence that increased

levels of anxiety and depression are precursors of reduced mental and physical HRQoL and increased tinnitus-related distress, and that the impact of Type D personality on HRQoL and tinnitus-related distress is largely mediated by anxiety and depression, although Type D also exerted direct effects on these outcomes.

According to our expectations, the presented LISREL models showed that the explained variance in mental HRQoL ($R^2 = 0.74$) was larger than for physical HRQoL ($R^2 = 0.33$) and tinnitus-related distress ($R^2 = 0.69$). This indicates that psychological distress has a larger impact on mental HRQoL and tinnitus-related distress than on physical HRQoL in tinnitus patients, which makes sense conceptually. Because there is an overlap between anxiety, depression, mental HRQoL, and distress induced by tinnitus, this might explain the lower regression coefficient between Type D and mental HRQoL, with most of the variance following a pathway via anxiety and depression.

Psychological distress has been described to be the most important predictor of impaired HRQoL in chronic diseases in general (36–38). The term “psychological distress” may accurately describe the individualized, subjective patient response to acute or chronic illness (36,38). If individuals experience psychological distress, it may be manifested by an alteration from a stable baseline emotional state to one of anxiety, depression, demotivation, vital exhaustion, irritability, aggressiveness, self-depreciation, and even suicide in the extreme (37,39). Several tinnitus studies have reported that anxiety and depression are important indicators of poor HRQoL, contributing to the development of severe annoying tinnitus (40–42). Because vital exhaustion has previously been shown to be associated with psychological distress and poor HRQoL in patients with CVD (43), we decided to examine the role of vital exhaustion in tinnitus patients. Vital exhaustion was never previously investigated in tinnitus patients. Vital exhaustion was shown to directly predict both mental and physical HRQoL and tinnitus-related distress in tinnitus patients, and to exert an indirect effect on HRQoL moderated by anxiety and depression. These results demonstrate that the addition of vital exhaustion as an indicator for psychological distress may be worthwhile in future studies of tinnitus patients.

The finding that tinnitus patients with a Type D personality experience increased psychological distress is consistent with previously performed studies in CVD patients (43), but it is the first time that these relationships have been examined in tinnitus patients. This extends previous research on Type D personality also in CVD, showing that the impact of Type D personality on HRQoL may mainly be mediated by psychological distress. Taken together, the findings of the current study provide important information for both research and clinical practice, showing that tinnitus patients with a Type D personality are particularly prone to distress and therefore poor HRQoL and more tinnitus severity. Hence, to improve the HRQoL of tinnitus patients, interventions in

these patients should focus on reducing psychological distress, in particular, in Type D patients. Given the link between Type D personality and several adverse outcomes in the current study, in the clinical management of tinnitus patients, the DS14 could be used as a screening instrument to identify these high-risk patients. An international committee under the auspices of the European Society of Cardiology recommending which measures to use for identifying CVD patients with a high-risk psychological profile in clinical practice have also advocated the use of the DS14 in this regard (44). The advantage of using the DS14 in patients with chronic conditions such as tinnitus is that the scale is not confounded by somatic symptoms (45), which is a problem with some distress measures such as the Beck Depression Inventory. In addition, it is brief and comprises little burden to patients, allowing for the identification of high-risk patients without having to apply a more extensive test battery.

In conclusion, we found that in a tinnitus population, Type D patients experienced more psychological distress and poorer HRQoL than non-Type D patients. Type D personality was a direct predictor of mental and physical HRQoL and tinnitus-related distress, but the impact of Type D on HRQoL and tinnitus-related distress was largely mediated by anxiety and depression. Anxiety, depression, and vital exhaustion were direct predictors of both measures of HRQoL and disease-related distress in this tinnitus population. These results provide evidence that increased levels of anxiety and depression are precursors of poor HRQoL and increased tinnitus-related distress, but that personality also plays an important role with its direct impact on HRQoL and tinnitus-related distress but also with its impact being mediated by psychological distress. From a clinical point of view, these results underline that to improve HRQoL and decrease tinnitus-related distress in tinnitus patients, treatment and psychosocial interventions should be mainly directed at reducing anxiety and depression especially in those patients with a Type D personality.

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